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Plecoptera Capniidae of the Italian Region. (Insecta)

Abstract – This paper provides illustrated keys of the 3 genera and 6 species belonging to the family Capniidae recorded in the Italian Region. Drawings of the taxonomic characters of the species terminalia, and photos of a living specimen for each genus are given. These illustrations make easier the keys identification of the genera and the species discussed. Data about each species are divided into four categories: description, which lists the main taxonomic data on male and female adult, and mature nymph; ecology, which includes for each species information on the type of watercourse, altitudinal distribution and flight period; remarks, which contain various kind of data not included in the other categories, and distribution, which deals with distribution patterns and, gives a detailed listing of recording sites in Italy and in the Swiss high Ticino basin.

Riassunto – Plecotteri Capniidae della regione italiana (Insecta).

Questa nota comprende le chiavi dicotomiche illustrate dei 3 generi e delle 6 specie appartenenti alla famiglia Capniidae presenti nella regione italiana. Al fine di rendere più agevole il loro riconoscimento, il testo è corredato da una serie di disegni dei più importanti caratteri tassonomici delle specie e di alcune fotografie che illustrano l'*habitus* di ciascun genere. La trattazione di ciascuna specie è suddivisa in quattro parti: descrizione, che contiene una concisa rassegna dei più importanti caratteri tassonomici degli adulti e della ninfa matura; ecologia, che fornisce informazioni riguardo al tipo di corso d'acqua, alla distribuzione altitudinale e ai periodi di attività immaginale; osservazioni, che si riferiscono a ulteriori ragguagli non compresi nelle altre suddivisioni e distribuzione geografica, che precisa la categoria corologica, la distribuzione generale e quella nella regione italiana con l'elenco delle località di ritrovamento in Italia e nel bacino superiore del Ticino.

Key words: Plecoptera, Capniidae, Italian Region, taxonomy.

The family Capniidae was established by Klapálek in 1905. Its *genus typicum* is *Capnia* which was erected by Pictet in 1841, to receive five species and presumably two other ones: *Chloroperla bifrons* Newman, 1839 and *Perla pygmaea* Zetterstedts, 1840. Of these 7 species initially considered by Pictet the last two together with *C. nigra* Pictet, 1833 are nowadays in the genus *Capnia*, while the other 4 species have been removed to other genera.

According to Zwick (1973), the family Capniidae is divided into 14 genera including more than 200 species. Actually the number of both genera

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and species has increased because of new descriptions and revision due to studies carried on by North American students.

The family has an holarctic distribution; in Europe it is represented only by the genera *Capnia*, *Capnopsis* and *Capnioneura*, which occur in the Italian Region. The genus *Capnia* includes few European species, but a large number occurs both in East Asia and North America. *Capnopsis* and *Capnioneura*, are West palaeartic genera recorded almost only in Europe.

The geographical boundaries of the Italian Region include not only Italy but also Corsica, and a few drainage basins of the internal slopes of the Alps (Fig. 5). They are the Roja basin in France, the high Ticino basin in Switzerland and the Isonzo basin in Slovenia.

Family **Capniidae** Klapálek, 1905

Stoneflies of small to middle size, length of body 4-10 mm. Body dark-brown or black, wings hyaline or smoky grey.

Head of prognathous type, generally as wide as the pronotum or a little wider, bearing well developed compound eyes and three ocelli. Mandibles are normally developed and toothed. The labial palpi are 3-segmented; the maxillae palpi are 5-segmented. The antennae are long, thin, multi-articulate, about as long as the length of the head and the pronotum combined.

The pronotum is quadrilateral, longer than wide or a little wider. The wings are membranous, their longitudinal and crossing veins are more reduced than in the other Nemuroidea families. They are held flat over the abdomen in repose. The family includes also several brachypterous or apterous species occurring mainly in the Nearctic region. Legs are long and slender, tarsi 3-segmented with the first and the third segment similar in length while the second one is smaller.

The abdomen is composed of 10 segments, terga and sterna belonging to the first 8 segments are clearly divided at each side by a wide membranous strip. The distal terga are separated from the corresponding sterna by a thin membranous strip. The male 9th sternum is composed of an ogival-shaped subgenital plate more or less lengthened backwards. The epiproct varies in size and shape according to different genera. It is well developed and reflexed over the tip of the abdomen in *Capnia*; it arises upwards perpendicular to the abdomen axis in *Capnopsis*; it is smaller, pear-shaped and directed obliquely upwards and backwards in *Capnioneura*. The paraprocts are small in *Capnia* and *Capnopsis*, much developed in *Capnioneura*. In the female the 8th sternum bears a subgenital plate, which is well developed in *Capnia*, less developed in *Capnioneura*, just a little developed or not differentiated in *Capnopsis*. Cerci are long, antennae-shaped and multi-articulate in *Capnia* and *Capnopsis*, short, stocky and composed of a single segment in *Capnioneura*.

The nymphs have body elongate and slender, yellowish or brownish in colour; the wing-pads are subparallel in *Capnia* (Fig. 2a), feebly diverging in *Capnioneura* and *Capnopsis* (Fig. 2b-c); the second tarsal segment is clearly smaller than both the first and the third. The main characteristic features of *Capnia*, *Capnioneura* and *Capnopsis* nymphs, will be summarized in the treatment of each genus.

Key to genera

Adults

- 1 Cerci either as long as the abdomen or longer, composed by about 20 segments. Anterior wing with at least an additional cross-vein, besides the humeral, between S and Sc (Fig. 1a). *Capnia*
- Cerci shorter than abdomen. Anterior wing without any additional cross-vein between S and Sc. 2
- 2 Cerci composed by a single segment. Anterior wing with an additional cross-vein between M_2 and C_1 . Posterior wing normally grown with the anal area well developed (Fig. 1b). *Capnionaura*
- Cerci multi-articulate composed by 6 to 10 segments. Anterior wing with a single cross-vein between M_2 and C_1 , that continues up to C_2 . Posterior wing shortened without the anal area (Fig. 1c). *Capnopsis*

Nymphs

- 1 Body covered by hairs. Wing pads parallel or subparallel to each other. Abdominal terga from the 1st to the 9th separated from the correspondent sterna. Cerci as long as or shorter than the abdomen, provided with bristles. 2
- Body hairless. Wing pads long, slender, feebly divergent. Cerci distinctly longer than abdomen, hairless (Fig. 2b) *Capnionaura*
- 2 Whole body covered by long and thick hairs. Eyes with a fringe of long hairs. Wing pads short and stocky: the fore ones subparallel, the hind ones are feebly divergent. Abdominal terga and sterna separated by a thin carina (Fig. 2c). *Capnopsis*
- Whole body covered by short hairs. Eyes without a fringe of long hairs. Wing pads long, thin, subparallel. Abdominal terga and sterna separated by a membranous strip (Fig. 2a). *Capnia*

Genus *Capnia* Pictet, 1841

Capnia Pictet, 1841: 318.

Typus generis. *Perla nigra* Pictet, 1833 = *Capnia nigra* (Pictet), 1833, designated by Enderlein, 1909.

Description. Body dark-brown or blackish, size between 5 and 10 mm. Wings are smoky grey; the anal area of the hind wing is normally developed. Abdominal terga and sterna separated by a membranous strip. Cerci are longer than abdomen, composed by several segments, usually about 20.

Male abdomen. One or more terga between the 6th and the 9th bear a sclerotized posteromedian knob. The 10th sternum is lengthened backwards

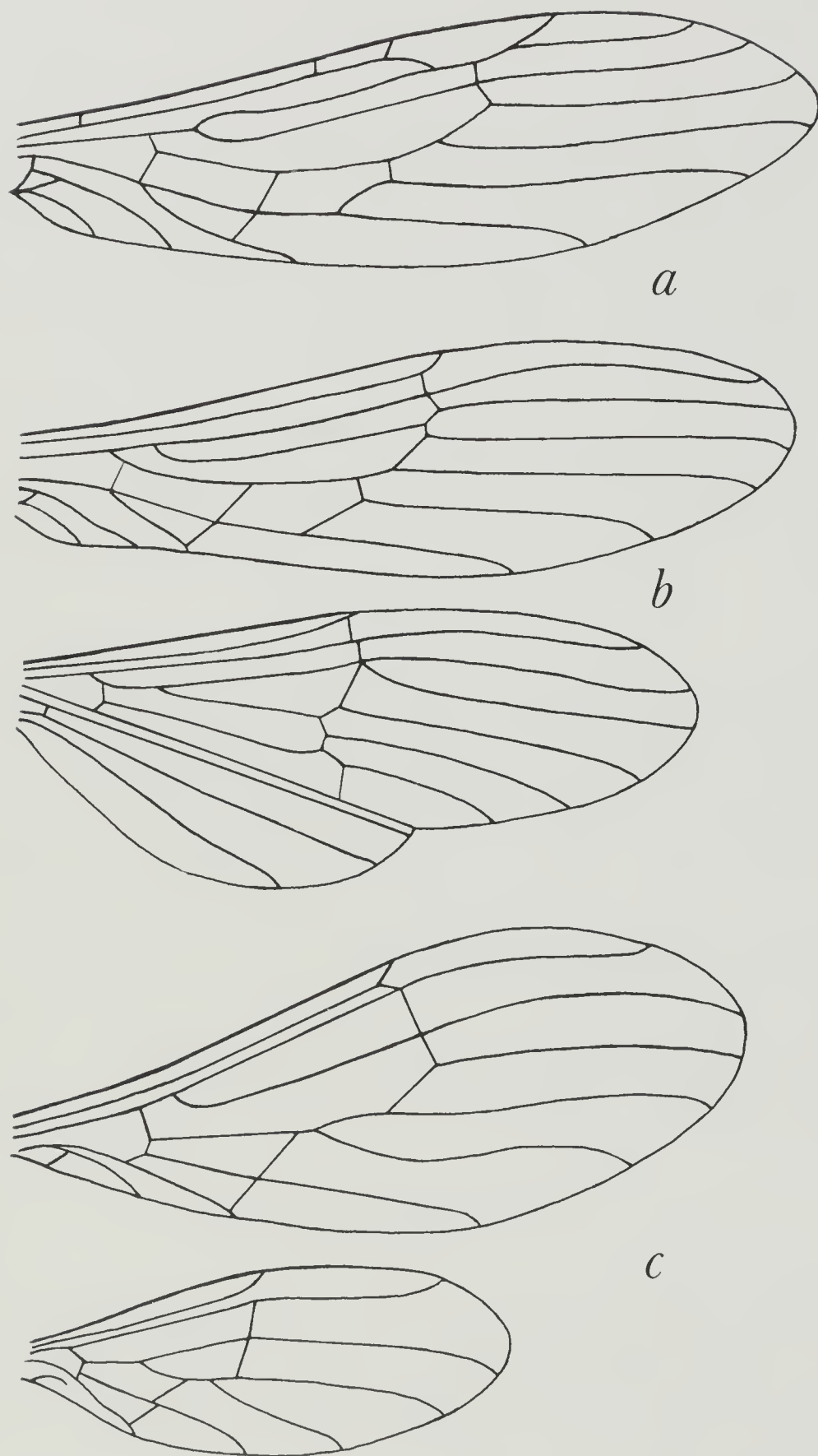


Fig. 1. Wings of Capniidae. *a*: right forewing of *Capnia nigra*; *b*: right forewing and hind wing of *Capnioneura nemuroides*; *c*: right forewing and hind wing of *Capnopsis schilleri schilleri*.

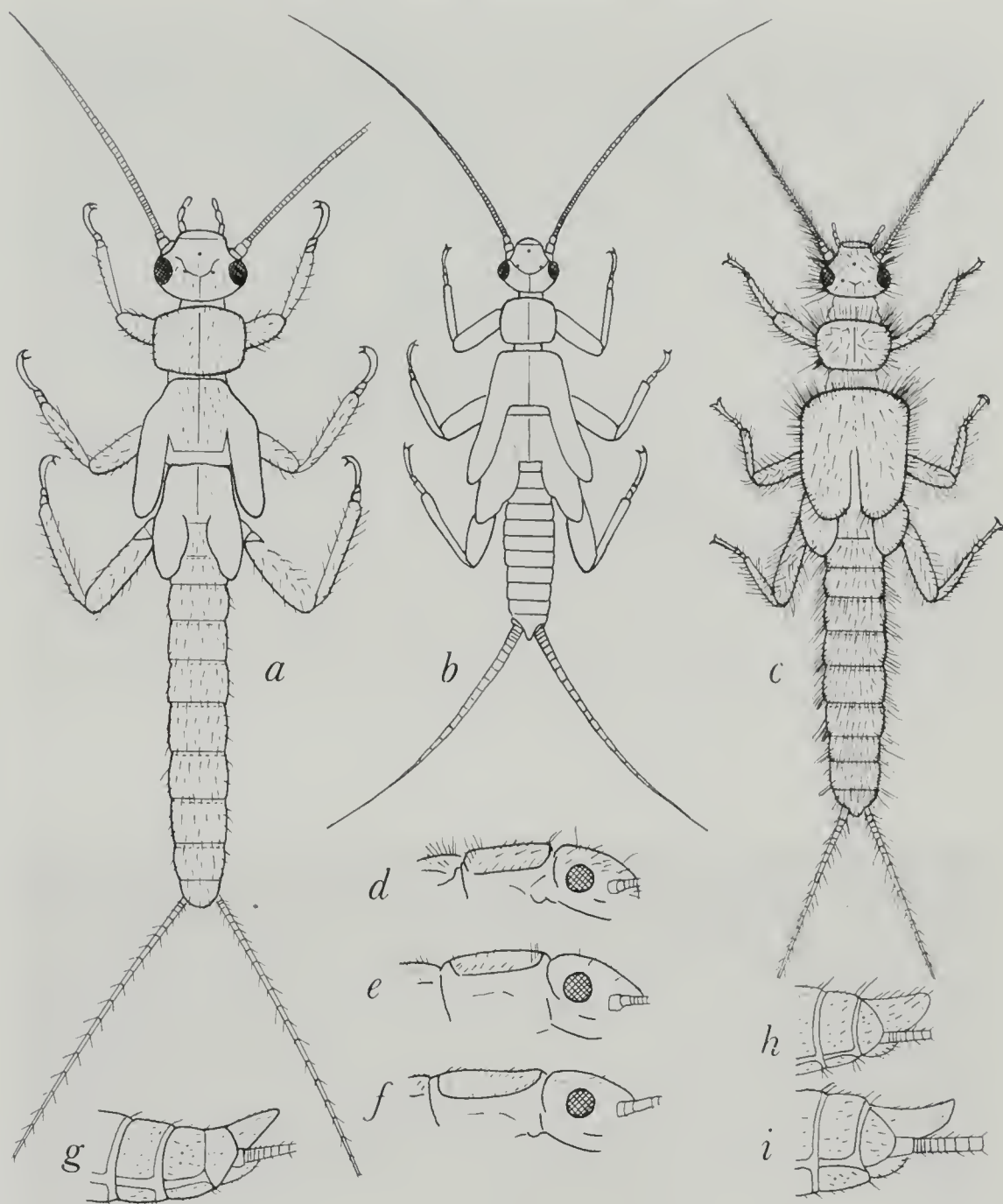


Fig. 2. Nymphs of Capniidae. a-c: schematic drawings of *Capnia nigra* (a), *Capnioneura nemuroides* (b) and *Capnopsis schilleri* (c). d-i: head and pronotum in lateral view, and tip of the abdomen of *Capnia vidua vidua* (d, h), *Capnia nigra* (e, g) and *Capnia bifrons* (f, i). (a and c original; b, d-i after Aubert, 1946 and 1959).

by a sclerotized plate. Epiproct big, always well developed, reflexed over the distal abdominal terga.

Female abdomen. The 8th sternum has a pigmented and partially sclerotized subgenital plate, the shape of which embraces the main characters useful for specific determination.

Mature nymph. Slender, its colour varies from straw-yellow to light-brown, it is very similar to the nymph of *Leuctra*, from which it can be di-



Fig. 3. *Capnia bifrons* Newman, top: male from Savona, Porassino brooklet, Ligurian Apennines; bottom: female from Mongrando, Viona stream, Pennine Alps.

stinguished by the pleural membrane separating the first 9 sterna from the corresponding terga. Still the paraprocts are wider and longer in both sexes. In the male mature nymph the last abdominal segment is produced in form of a cone.

Three species of *Capnia* occur in Italy. All of them emerge in the winter; adults may be often collected walking on snow.

Key to the species of *Capnia*

Males

- | | | |
|---|--|--------------------|
| 1 | 7th tergum without any posteromedian protrusion. Hind margin of the 9th tergum with a dorsal knob directed upwards. Short winged (Fig. 3, 4a-c). | <i>bifrons</i> |
| – | 7th tergum with a posteromedian spinose protrusion. Full winged. | 2 |
| 2 | Epiproct smaller, simple, subconical (Fig. 6a-d). | <i>nigra</i> |
| – | Epiproct bigger, with a subapical inferior hollow (Fig. 7a-d). | <i>vidua vidua</i> |

Females

- | | | |
|---|---|--------------------|
| 1 | Subgenital plate simple undifferentiated (Fig. 4d). | <i>bifrons</i> |
| – | Subgenital plate of different shape. | 2 |
| 2 | Subgenital plate with a longitudinal straight median well pigmented stripe (Fig. 6e). | <i>nigra</i> |
| – | Subgenital plate prolonged backwards by a subtriangular or ogival lobe (Fig. 7e). | <i>vidua vidua</i> |

Mature nymphs

- | | | |
|---|--|--------------------|
| 1 | Dorsal hair of the head about as long as the diameter of the eye. Marginal hairs of pronotum as long as 1/10 of the pronotum length (Fig. 2d). Epiproct of the ♂ rounded at the tip (Fig. 2h). | <i>vidua vidua</i> |
| – | Dorsal hair of the head clearly shorter than the diameter of the eye. Marginal hairs of pronotum as long as 1/5 of the pronotum length (Fig. 2e-f). Epiproct of the ♂ either pointed or truncate at the tip. Full winged (Fig. 2g, i). | 2 |
| 2 | Metanotum with two strong bristles in its anterior half and many thin hairs alongside the median line (Fig. 2e). Wing pads of the m normally developed. Epiproct of the ♂ pointed (Fig. 2g). | <i>nigra</i> |
| – | Metanotum with scattered short hairs similar to each others (Fig. 2f). Wing pads of the ♂ reduced. Epiproct truncate at the tip (fig. 2i). | <i>bifrons</i> |

***Capnia bifrons* (Newman), 1839**

Chloroperla bifrons Newman, 1839: 99

Capnia quadrangularis Aubert, 1946: 22-24.

Capnia nigra (sensu Auct. nec Newman) Morton, 1894: 60-61 tab. 2 fig. 1-5; Hanson, 1946: 194-210 numerous figs.; Despax, 1951: 154-156 fig. 69 a-b.

Capnia bifrons, Illies, 1955: 78 fig. 8, 74; Aubert, 1959: 71-73 fig. 217, 219; Kis, 1974: 119-120 fig. 74; Hynes, 1958: 37, 1977: 37, fig. 14 a-c. Lillehammer, 1988: 128, 136-137 fig. 224-230.

Type locality. Great Britain, Scotland, Lanark.

Description. Body dark-grey or blackish. Male brachypterous, female full-winged. Length of body: ♂ 4.7-6.5 mm, ♀ 6.9-10.5 mm; Length of forewing ♂ 1.0-2.5 mm, ♀ 6.8-9.5 mm.

Male abdomen (Fig. 4a-c). The 9th tergum bears towards its hind margin a median sclerotized knob directed upwards. Subanal plate of the 9th sternum ogival-shaped; close to its anterior margin arises a small median sclerotized lobe directed backwards. Epiproct long, gently arched; in dorsal view it appears subcylindrical with the lateral sides feebly concave and rounded apex.

Female abdomen (Fig. 4d). Subgenital plate quite large, its sides are a little convex and the posterior margin is subrectilinear. The basal inner angles of the paraprocts are connected between them by a small pigmented lobe, sometimes not clearly discernible.

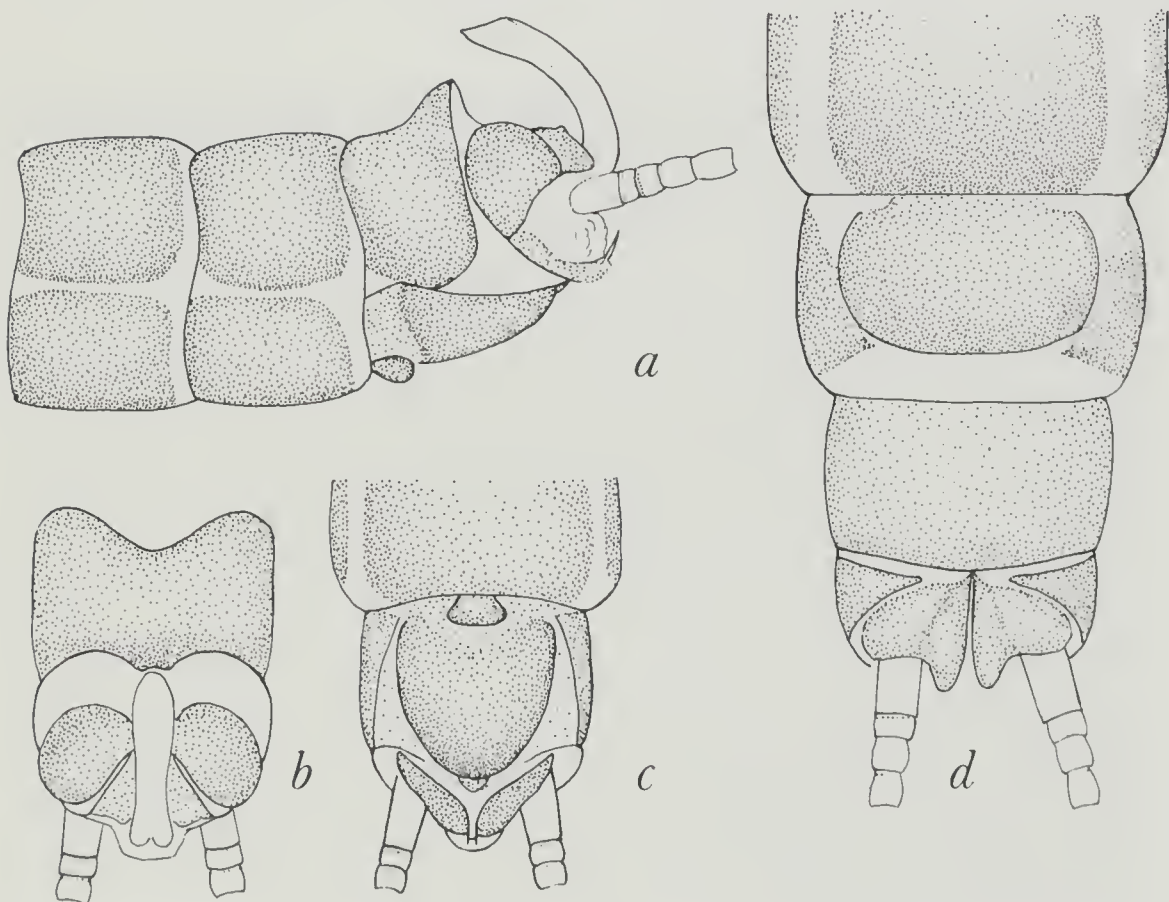


Fig. 4. *Capnia bifrons* Newman: tip of the male abdomen, *a* in lateral view, *b* in dorsal view, *c* in ventral view; *d* tip of the female abdomen in ventral view.

Mature nymph (Fig. 2*f-i*). Detailed descriptions and drawings of the nymph are in Aubert (1946, 1959), Brinck (1949) and Hynes (1958). Length of body: 6-10 mm; general colour brown-yellowish or red-brown. Body hairy, hairs are more abundant than in *C. nigra*. Wing-pads full developed in the female, rudimentary in the male. Male epiproct conical subtruncate at

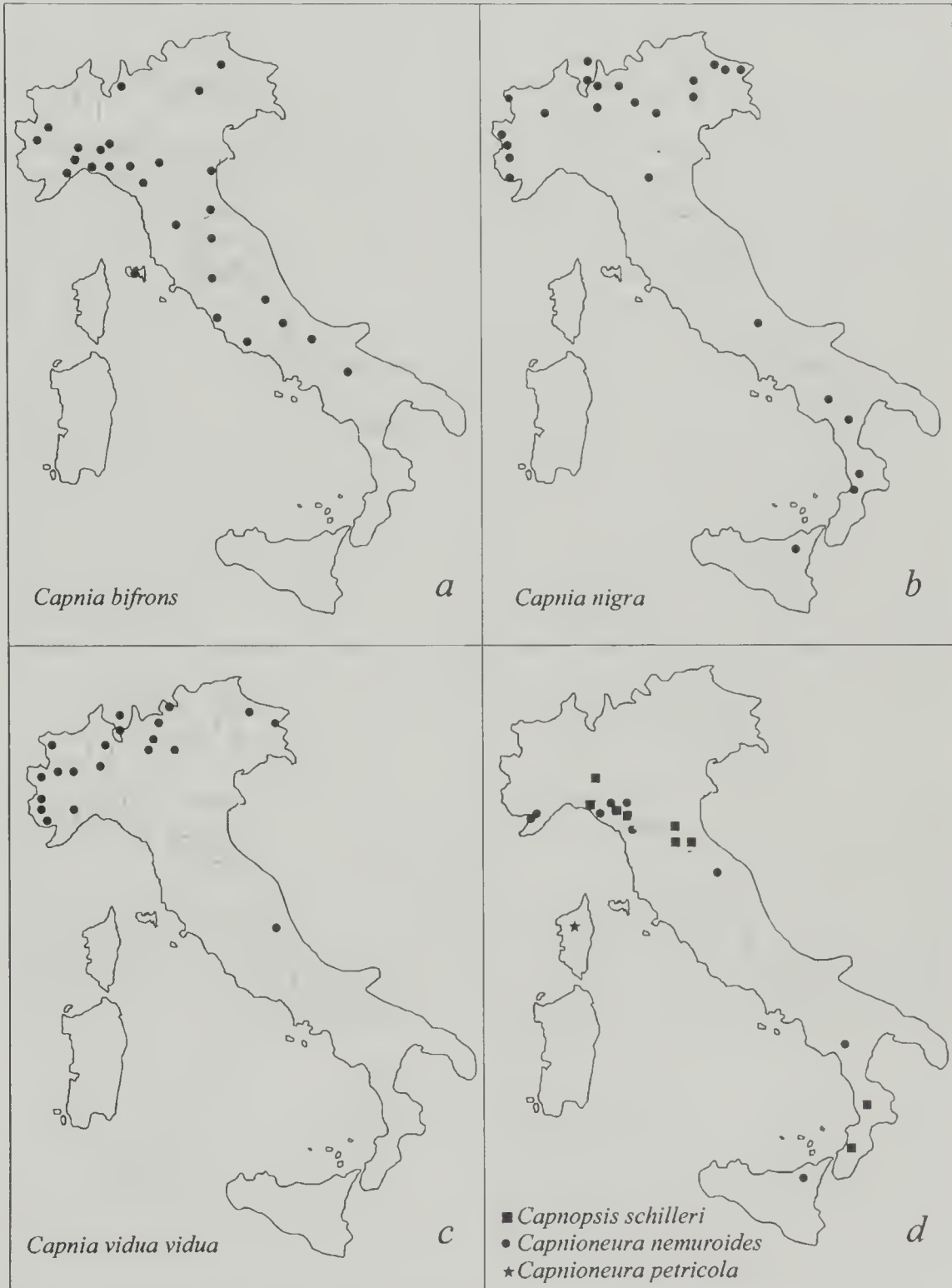


Fig. 5. Distribution of all the species of Capniidae recorded in the Italian Region.

the tip, covered with short hairs. Female last abdominal segment with tufts of hairs. Nymphal biology of *C. bifrons* had been studied by Hynes (1941), Brinck (1949) and Khoo (1964).

Ecology. *C. bifrons* occurs in Italy in low altitude water courses between 20 and 800 m a.s.l. Adults emerge in winter between January and April-May.

Remarks. In addition to the characters shown in the key, the adult male of *C. bifrons* may be easily separated from those of the other species of *Capnia*, by its shortened wings, and the ventral lobe lacking in all other European species.

Drumming signals of *C. bifrons*, have been recorded by Rupprecht (1965, 1982, 1997) in different countries of Europe. This author has remarked that signals differ from each others in some populations. Also in the north of Italy Rupprecht (*in litteris*) has noticed a population of *C. bifrons* inhabiting a few Ligurian Apennines brooklets having a different dialect from those of another population living in a stream at the foot of the western Alps. The possible separation of such populations at a subspecific level by morphological characters is a problem presently studied by Rupprecht.

Distribution. *C. bifrons* is an European species spread from Scandinavia to the southern peninsulas and from Great Britain to Russia. In Italy the species occurs over a wide area at the foot of the Alps and in the Apennines (Fig. 5a). PIEMONTE: Sanfront (Ravizza Dematteis & Ravizza, 1988); Torino (Consiglio, 1962); Mongrando! Cartosio Gaini, Ponte Erro (Ravizza, 1976)); Sardiniano! Borgoratto Alessandrino! Molare! Capriata d'Orba! LOMBARDIA: Como (Consiglio, 1967, 1971); S. Martino di Varzi, Casanova Staffora (Ravizza, 1974b). VENETO: Borca di Cadore (Consiglio, 1971); Tarzo! LIGURIA: Mallare! Cairo Montenotte! Dego (Consiglio, 1971); Savona (Ravizza & Ravizza Dematteis, 1983); Montenotte, Pontinvrea (Ravizza, 1976); Ferrania! Piampaludo! Molare! Capriate! Priosa di Rezzoaglio! EMILIA-ROMAGNA: Farini d'Olmo (Ravizza & Ravizza Dematteis, 1979); Ferriere! Forlì (Consiglio, 1960); Cullacce, Sasso Fratino, La Stretta, Poggio Palaio (Fochetti & Campadelli, 1988); Foresta Lama, Fonte Maresciallo (Fochetti & Campadelli, 1991). TOSCANA: S. Fiora (Nicolai & Fochetti, 1981); Isola d'Elba Marciana Alta (Consiglio, 1958a). UMBRIA: Lago Trasimeno (Consiglio, 1960); Corbara, Baschi (Consiglio, 1967). LAZIO: Gerano (Consiglio, 1958b); Monti della Tolfa (Nicolai & Fochetti, 1983). ABRUZZI: Pescasseroli (Consiglio, 1963); Passo Capannelle, between S. Pellino and Marana (Consiglio, 1967). MOLISE: Pescolanciano (Nicolai & Fochetti, 1991); Guglianesi Grotta dei Gessi! PUGLIA: Faeto (Nicolai & Fochetti, 1991).

***Capnia nigra* (Pictet), 1833**

Perla nigra Pictet, 1833: 61

Capnia conica Klapálek, 1909: 101 one figure; Kühnreiber, 1934: 59 fig. 41; Despax, 1951: 153, 158 fig. 70.

Capnia nigra Illies, 1955: 80 fig. 72,77; Aubert, 1959: 71-72 fig. 218, 220; Kis, 1974: 118-119 fig. 77; Lillehammer, 1988: 128, 137 fig. 225-231.

Type locality. Switzerland, Arve river near Geneva.

Description. Body dark-grey or black. Full-winged species. Length of body: ♂ 5.5-6.5 mm, ♀ 6-8 mm; Length of forewing ♂ 5.8-6.2 mm, ♀ 7.4-8.2 mm.

Male abdomen (Fig. 6a-d). Hind margin of the 7th tergum provided with a big hemispherical knob, bearing some short spines. 9th sternum with a short subgenital plate. Paraprocts as in fig. 6b-c. Epiproct subconical, in lateral view it appears narrowed toward the apex with the tip gently bent downwards.

Female abdomen (Fig. 6e). Subgenital plate hind sides feebly concave with a longitudinal median strip strongly pigmented.

Mature nymph (Fig. 2a, e-g). The nymph has been studied and described by several authors (Kühtreiber, 1934; Hynes, 1941; Aubert, 1946, 1950, 1959; Despax, 1951; Brinck, 1949). Length of full-grown nymph body: 5.5-8.0 mm; general colour of the body brown-yellowish dorsally, straw-yellowish ventrally. Head and pronotum hairs as in fig. 2e. Male epiproct sharpened at the tip.

Ecology. *Capnia nigra* inhabits streams of different size and flow. It traverses a large altitudinal gradient, occurring both in the plain of the Po and of the Venetian rivers, between 50 and 300 m a.s.l., and in many types of mountain streams at altitudes ranging from 500 to 2,000 m. The adults emerge in winter; their flight period in the Italian Alps is from January to April.

Distribution. Eurosiberian species. Absent in Scandinavia and in the Baltic countries but widespread in central and southern Europe. In Italy it is widely distributed in the Alps, Pre-Alps and in the Po plain, in the Apennines it occurs here and there, exhibiting a scattered distribution, due probably to scarce collecting in winter (Fig. 5b). PIEMONTE: Moiola! Vinadio! Prinardo! S. Giacomo! Pradleves, Valgrana (Ravizza & Ravizza Dematteis, 1986); Bellino! Crissolo Piano della Regina (Ravizza Dematteis & Ravizza, 1988); Torino (Navas 1933); Borgofranco d'Ivrea! Varallo Sesia! VALLE

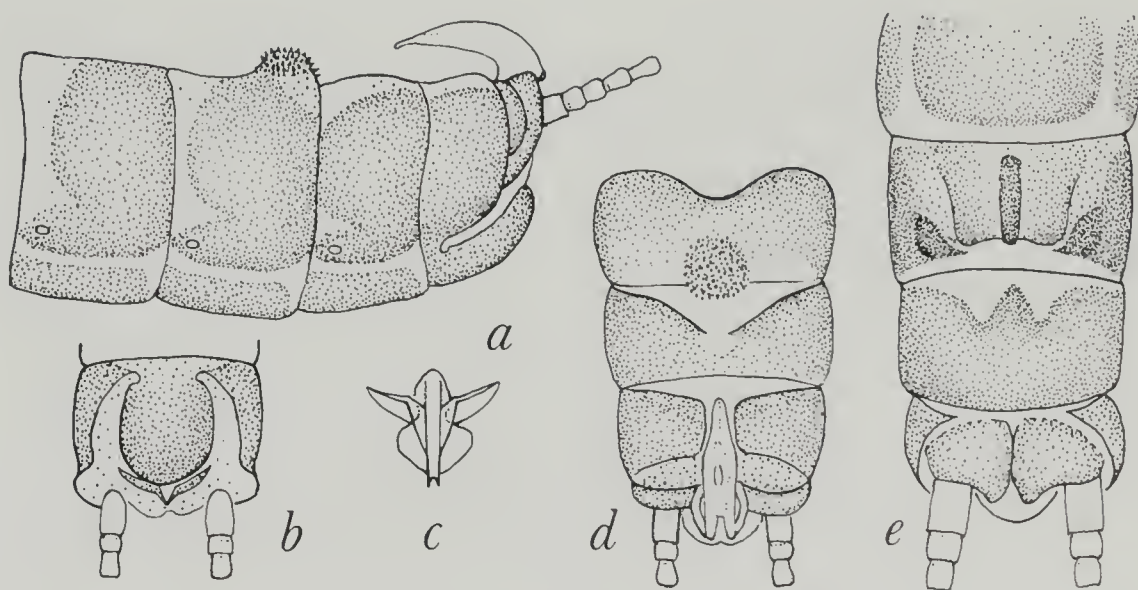


Fig. 6. *Capnia nigra* (Pictet): tip of the male abdomen, a in lateral view, b in dorsal view, d in ventral view; c epiproct in ventral view; e tip of the female abdomen in ventral view.

D'AOSTA: Lavachey (Ravizza 1974a); Sarre! CH-TICINO: Mezzovico, Solduno, Bellinzona, Lumino, Cristallina, Pian Segno, Acqua Calda (Aubert et al., 1996); CH-GRIGIONI: Grono, Pian S. Giacomo (Aubert et al., 1996). LOMBARDIA: Camerata Cornello, Carona (Ravizza, 1975); Bagolino! Malonno! Vezza d'Oglio! Ponte di Legno! VENETO: Verona (Festa 1949 sub nom. *C. conica*; Consiglio, 1966); Perarolo di Cadore! Longarone! FRIULI-VENEZIA GIULIA: Forni di Sopra! Casera Razzo, Malghe del Montasio (Masutti, 1978). EMILIA-ROMAGNA: Castelvetro di Modena (Festa, 1949). ABRUZZI: Opi val Fondillo, Opi valle Jancina, Opi valle Cacciagrande (Consiglio, 1958b, 1963). BASILICATA: Mezzana Frido (Aubert, 1953, 1958); Madonna di Viggiano, Monte Volturino (Nicolai & Fochetti, 1991). CALABRIA: Frascineto!, S. Giovanni in Fiore (Aubert, 1953, 1958); Cagno, Botte Donato, Camigliatello, Serra Pedace (Nicolai & Fochetti, 1991). SICILIA: Cesarò Monte Soro (Consiglio, 1961).

Capnia vidua Klapálek, 1904

Capnia vidua ssp. *vidua* Klapálek, 1904: Aubert, 1950: 313-315 fig. 34, 36-37; Despax, 1951: 153, 156 fig. 69 c-d; Kis, 1974: 118-121 fig. 65; Hynes, 1977: 37, fig. 14 e-g. Lillehammer, 1988: 128, 138 fig. 227-233.

Other subspecies:

Capnia vidua ssp. *collarti* Aubert, 1950: 315 fig. 33. *Loc. typ.*: Belgium, Hautes-Fagnes, Hockai.

Capnia vidua ssp. *anglica* Aubert, 1950: 315 fig. 35. *Loc. typ.*: England, Cheshire, Woodhead.

Capnia vidua ssp. *brachyptera* Hynes, 1955: 164. *Loc. typ.*: Iceland, Fluss Laxa.

Capnia vidua ssp. *rilensis* Rauser, 1962: 77 fig. 20. *Loc. typ.*: Bulgaria, Borovec, Mt. Rila.

Type locality. ssp. *vidua* Klapálek: Romania, Transylvania, southern Carpathians.

Description. Body black or dark-grey. Length of body: ♂ 5-7 mm, ♀ 7.5-9.5 mm. Length of forewing ♂ 5-7 mm, ♀ 8-9 mm.

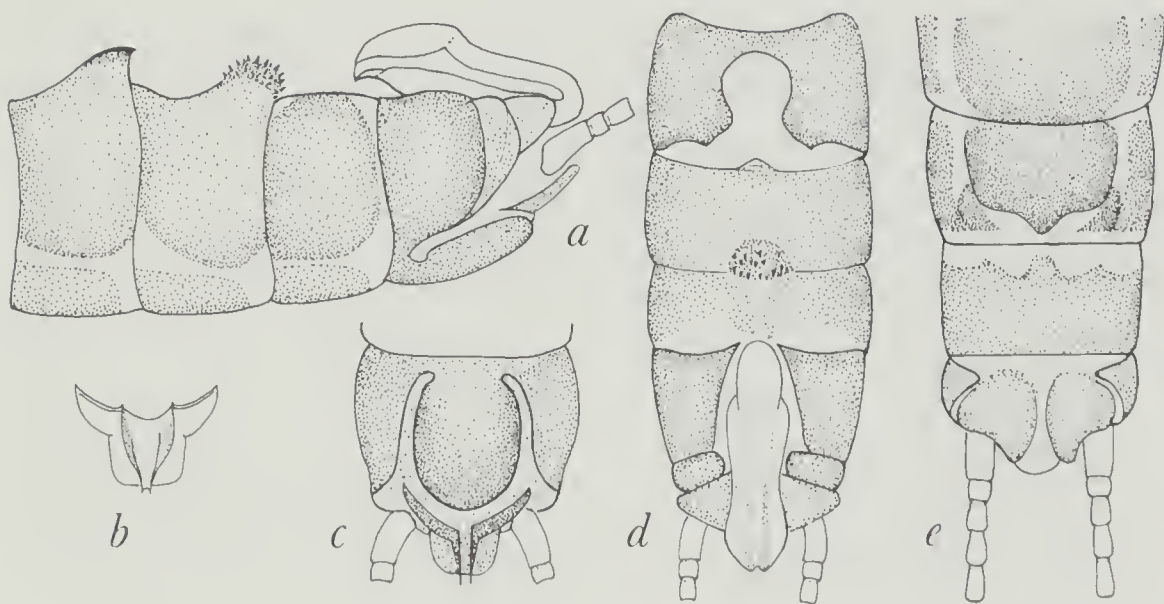


Fig. 7. *Capnia vidua vidua* (Pictet): tip of the male abdomen, *a* in lateral view, *d* in dorsal view, *c* in ventral view; *b* epiproct in ventral view; *e* tip of the female abdomen in ventral view.

Male abdomen (Fig. 7a-d). Hind margin of the 7th tergum bearing a median big hemispherical knob covered by many spines. Epiproct large, well developed, composed of two superposed sclerotized limbs connected between them by a depigmented membrane. Paraprocts as in fig. 7b-c.

Female abdomen (Fig. 7a-d). Subgenital plate extended posteriorly with a lobe, the shape and size of which varies from subtriangular to ogival.

Mature nymph (Fig. 2d, h). The fully-grown nymph of the subspecies *vidua* was described and illustrated with drawings by Aubert (1950, 1959) and by Hynes (1955). Length of body 4.5-8.5 mm; general colour brown-yellowish. Head and pronotum hair placed as in fig. 2d. Male epiproct rounded at the tip.

Ecology. Orophilic and rheophilic species, occurring in Italy in different types of watercourses, at elevations ranging from 800 to 2,500 m. It is a characteristic winter emerger; adults are usually collected walking on the snow alongside the streams from which they have emerged, together with some other precocious stonefly species. In the Italian Alps its flight period extends from January to April below 2,000 m, but from May to June between 2,000 and 2,500 m.

Remarks. *Capnia vidua* is a polytypic species. Each of its different geographical races is localised in areas external to that of *C. vidua vidua*. The subspecies morphological characters regard in particular the different shape of both the male 7th tergum knob, the epiproct and, in some western races only, the shortwingedness of both sexes.

Distribution. The species has an European distribution. The ssp. *vidua* occurs in most of Europe. In Scandinavia, it has been recorded only northward the Polar Circle. In Italy it is localised in the mountain regions. It is widespread in the Alps, while in the Apennines it has been recorded in one site only (Fig. 5c). PIEMONTE: Certosa di Pesio! Bagni di Vinadio! Priarardo! Argentera! Colle della Maddalena! Castelmagno, Chiappi, Pradleves (Ravizza & Ravizza Dematteis, 1986); Chianale! Piano della Regina, Crissolo, Paesana (Ravizza Dematteis & Ravizza, 1988); Bardonecchia! Balme di Lanzo! Ceresole Reale! Orco stream 2,500 m (Ravizza & Ravizza Dematteis, 1994); Piamprato Soana! Biella Favaro, Biella Oropa (Ravizza & Ravizza Dematteis, 1990, 1991); Bocchetto di Sessera! Balangera! Molli! VALLE D'AOSTA: Lavachey (Ravizza, 1974a). CH-TICINO: Isonne, Ghirone (Aubert et al., 1996). CH-GRIGIONI: Pian S. Giacomo, Grono (Aubert et al., 1996). LOMBARDIA: Mezzoldo, Cambrembo, Roncobello, Carona (Ravizza, 1975); Ponte di Legno! Sondrio! Foscagno (Ravizza & Ravizza Dematteis, 1994). VENETO: Sappada (Consiglio, 1971). FRIULI-VENEZIA GIULIA: Sauris di Sopra casera Razzo (Consiglio, 1971; Masutti, 1978); Sella Nevea (Fochetti & Nicolai, 1985). ABRUZZI: Pietracamela (Consiglio, 1963).

Genus *Capnioneura* Ris, 1905

Capnioneura Ris, 1905: 93 fig. 1-2.

Typus generis. *Capnioneura nemuroides* Ris, 1905

Description. Small sized species, it looks like a small Nemouridae (Fig. 8). Head and its appendages features as in the other genera of the family.

Pronotum without the fore and hind transversal sutures, but bearing some more or less evident callosity. Wings either fully developed or reduced according to species. Cerci are stocky, composed of a single segment; those of the male are asymmetric because of an inner hind protraction, those of female have a vestigial second segment.

Key to the species of *Capnioneura*

Males

- | | | |
|---|---|-------------------|
| 1 | Hind inner prominence of cerci strong, rounded, membranous, little sclerotized (Fig. 9a-b). | <i>nemuroides</i> |
| – | Hind inner prominence of cerci small, subconical, well sclerotized (Fig. 9f-g). | <i>petricola</i> |

Females

- | | | |
|---|--|-------------------|
| 1 | 7th and 8th sterna mostly fused between each other. 8th sternum hind margin shaped like a «W» with very obtuse angles (Fig. 9e). | <i>nemuroides</i> |
| – | 7th and 8th sterna fused between each other in their median third. 8th sternum hind margin with a median notch (Fig. 9l). | <i>petricola</i> |

Male abdomen. The sclerotized epiproct arises from the centre of the 10th tergum hind margin, it is pear-shaped and directed obliquely upwards.



Fig. 8. *Capnioneura nemuroides* Ris, female from Santa Margherita di Staffora, Staffora stream, Northern Apennines.

The specillum, small and bent at its tip, is like a more or less open hook or sickle, its concavity facing backwards. Paraprocts styli are membranous, long, thinned towards the apex, inside which there is a slim longitudinal sclerotized thin-plate.

Female abdomen. The 7th sternum hind median portion protrudes backwards merging with the 8th sternum. The 9th sternum anterior margin has a median prominence protruding onto the 8th sternum.

Mature nymph. Small in size, a little pigmented, its colour varies from straw-yellow to light-brown, antennae and cerci are very long (Fig. 2b). The wing-pads are more diverging than in the genus *Capnia*, but less diverging than in the family Nemouridae.

The genus has a Middle southern European distribution extended from the Iberian peninsula up to the Maghreb. The genus includes 8 species, two of which belong to the Italian Region fauna.

***Capnioneura nemuroides* Ris, 1905**

Capnioneura nemuroides Ris, 1905: 95 fig. 1-2, 1913: 178-185; Despax, 1951: 106 fig. 47; Illies, 1955: 81 fig. 78, 143; Aubert, 1959: 73 fig. 32; Berthélemy, 1969: 25-47 fig. 7-8, 18-20, 36.

Type locality. Switzerland, Zurich canton, Vordere Töss.

Description. General colour from grey to brown, legs yellowish with darker knees. Head a little wider than pronotum. Pronotum longer than wide. Wings hyaline a little smoky along the veins. Length of body: ♂ 3-5 mm, ♀ 4-5 mm. Length of forewing ♂ 5.0-5.6 mm, ♀ 6.0-7.5 mm (Fig. 8).

Male abdomen (Fig. 9a-d). The sclerotized strip across the 10th tergum basal, has a median protrusion and two thin lateral sclerotized strips which converge towards the base of the epiproct. Epiproct small, stocky, narrowed

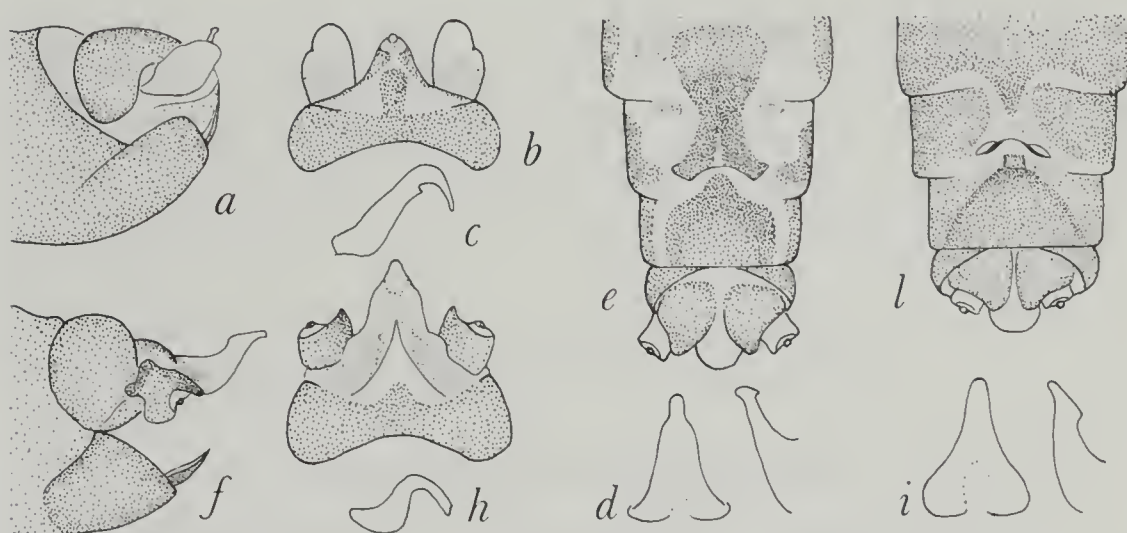


Fig. 9. *Capnioneura nemuroides* Ris: tip of the male abdomen, a in lateral view, b in dorsal view, c specillum in lateral view; d epiproct in ventral and lateral view; e tip of the female abdomen in ventral view. *Capnioneura petricola* Giudicelli (traced from Giudicelli, 1967 and Berthélemy, 1969): tip of the male abdomen, f in lateral view, g in dorsal view, h specillum in lateral view; i epiproct in ventral and lateral view; l tip of the female abdomen in ventral view.

towards the tip, bearing a thin apical tooth. Paraproct styli progressively narrowed towards the tip, with a longitudinal sclerotized sinuous thin-plate. Specillum, sickle-shaped in the distal third, with a small inferior indenture and pointed at the apex..

Female abdomen (Fig. 9e). The subtriangular 7th sternum hind median protrusion, is entirely joined to the 8th sternum pigmented areas. Its hind margin looks like a W with obtuse angles.

Mature nymph (Fig. 2b). Aubert (1946) described and illustrated with a drawing the fully grown nymph of this species. The main morphological characters agree with the ones of the genus. Length of body 3-6 mm, straw-yellow in colour, characterised by the almost complete lack of hairs. Antennae and cerci long. *C. nemuroides* nymph may be easily distinguished from those of both *Capnia* and *Capnopsis*, by the hairs lacking at all and by the remarkable thickness of the cerci. The biology of the species is unknown.

Ecology. *C. nemuroides* is a rheophilic species living in streams and brooks with a gravelled bed at altitudes ranging from 500 to 1,500 m. Its flight period extends from the end of April to June, with a peak of emergences in May. In some Northern Apennine bottom valley streams the species is sometimes quite abundant.

Remarks. *C. nemuroides* may be easily separated from all the other species of the genus, because of its morphological isolation (Berthélemy, 1969). From the allopatric *C. petricola* it differs by the characters listed in the key and shown in the drawings.

Distribution. South European species recorded from a few countries (France, Switzerland, Italy, Montenegro). In the Italian Region this species appears very rare in the Alps. It is widespread in the Apennines, where it exhibits a scattered distribution (Fig. 5d). PIEMONTE: Ponte di Nava (Ravizza & Ravizza Dematteis, 1977); Cabella Ligure! LOMBARDIA: Costiolo del Giovà, Pianostano, Casanova Staffora (Ravizza, 1974b). LIGURIA: Priosa di Rezzoaglio! EMILIA-ROMAGNA: Ferriere! Bedonia-Cordolo (Ravizza & Ravizza Dematteis, 1978); Lagdei di Corniglio (Ravizza Dematteis & Ravizza, 1994); Burraia, Cullacce Fonte Maresciallo, La Stretta, Foresta Lama (Fochetti & Campadelli, 1988, 1991). MARCHE: Tenna stream (Fochetti & Nicolai, 1987). BASILICATA: Mezzana Frido (Aubert, 1958, sub nom. *Capnionaura* sp.); La Maddalena Monte Arioso (Nicolai & Fochetti, 1991). SICILIA: Cesarò Monte Soro (Consiglio, 1961).

***Capnionaura petricola* Giudicelli, 1967**

Capnionaura petricola Giudicelli, 1967: 249-251 fig. 1-5; Berthélemy, 1969: 25-47 fig. 13, 21, 25.

Type locality. Corsica, Corte, brooks tributary to Tavignano stream, m 300 s.l.m.

Description. General colour brown with darker abdomen. Head wider than pronotum, this one is wider than long with four rounded protuberances placed two anteriorly and two posteriorly, respectively. Length of body: ♂ 3.4-4.1 mm, ♀ 5.0-5.6 mm. Length of forewing ♂ 8.2-10.0 mm, ♀ 12.0-12.8 mm.

Male abdomen (Fig. 9*f-i*). Terga covered by several black bristles. The sclerotized strip of the 10th tergum basal half, has a small median protrusion and hind median membranous strip. Epiproct with a big apex. Specillum, shaped as a stocky «S» subtruncate and toothed at the apex.

Female abdomen (Fig. 9*l*). Terga from the 1st to the 6th membranous and depigmented in their central area. Membranous area of the 7th tergum reduced, 8th and 9th terga sclerotized and well pigmented.

Nymph. Unknown.

Ecology. *C. petricola* is a winter species endemic to Corsica. It was recorded only in two adjacent temporary brooks, completely drought in summer, at 300 metres in elevation. Its flight period extends from December to February.

Remarks. Because of the habitat of *C. petricola* in low altitude temporary brooks, it may occur in other similar small streams in Corsica. One may conjecture the presence of this species also in Sardinia, where collections of Plecoptera have never been carried on in the cold season from November to March.

Distribution. Corsica, recorded only from the type locality (Fig. 5*d*).

Genus **Capnopsis** Morton, 1896

Capnodes Rostock 1892: 3 tab. I. (*nomen praeocc.*).

Capnopsis Morton, 1896: 61. (*nomen novum*)

Typus generis. *Capnodes schilleri* Rostock, 1892 = *Capnopsis schilleri* (Rostock), 1892.

Description. Genus including only one species, small to medium in size (length of body 3.5-9.0 mm). Body is black with wings smoky grey and dark veins. The hind wings are both of reduced size and lacking of the anal region (Fig. 1*c*). Characteristic of the genus are the cerci shorter than the abdomen composed at the most of 10 cercal segments. In the male the first tergum is mostly membranous and depigmented. The terga (from the 2nd to the 8th) show a depigmented transversal strip as wide as one third of the width of the corresponding tergum. The 8th and 9th sterna are sclerotized. Epiproct arising upward perpendicularly to the abdomen. In the female sterna the ones from the 1st to the 8th are divided by a membranous strip. Subgenital plate of the 8th sternum undifferentiated; its hind margin is slightly concave.

Nymphs small, strongly hairy, antennae and cerci shorter than in the preceding genera.

Capnopsis schilleri (Rostock), 1892

Capnodes schilleri Rostock 1892: 3 (*nom. praeocc.*).

Capnopsis schilleri schilleri, Morton, 1896: 61; Illies, 1955: 77, 81-82 fig. 79; Aubert, 1959: 71;

Kis, 1974: 124-125 fig. 68; Zwick, 1984: 1-7; Lillehammer, 1988: 128, 139 fig. 228-234; Zwick 1984: 2.

Capniella schilleri, Despax, 1951: 158 fig. 71.

Other subspecies:

Capnopsis schilleri ssp. *balcanica* Zwick 1984: 3. *Loc. typ.*: Bulgaria, Strandscha-Gebirge, Bosna (Balkan Peninsula).

Capnopsis schilleri ssp. *archaica* Zwick 1984: 3. *Loc. typ.*: Azerbaijan, Kjurakcai (Caucasus).



Fig. 10. *Capnopsis schilleri* (Rostock), male from Bosco di Corniglio, rivulet tributary to the Parma stream, Northern Apennines.

Type locality. Subspecies. *schilleri*: Germany, outskirts of Dresden (designated by Zwick, 1984).

Description. Body is black, wings smoky grey with blackish veins. Cerci usually composed by 8 segments, rarely by 7. Length of body: ♂ 3.5-8.0 mm, ♀ 4-9 mm. Length of forewing ♂ 5.2-7.0 mm, ♀ 5.6-7.9 mm (fig. 10).

Male and female abdomen (Fig. 11a-d)). Their morphological characters agree with those of the genus.

Mature nymph (Fig. 2c). The fully grown nymph of the type species was described and illustrated with drawings by Aubert (1958), from specimens collected in Sila (Calabria). Length of body 5-7 mm. Body light-brown, covered by short and thin hairs, together with tufts and crown of bristles, thick on the basal third of the antennae, on the sides of the head, on the pronotum, and on the wing-pads, so that such nymphs have a characteristic hairy appearance. Antennae short, about 2 mm in length. Pronotum wider than long. Fore wing-pads wide with subparallel external side rounded at the tip, the hind wing-pads are smaller. The biology of the nymphs was studied by Lillehammer (1975).

Ecology. It inhabits brooks and streams, but in the Northern Apennines it is more abundant in mountain booklets flowing on a substratum composed by small angular stones, rich in allochthonous matter, flowing through beech-wood between 800 and 1,200 m. Sometimes rare specimens may

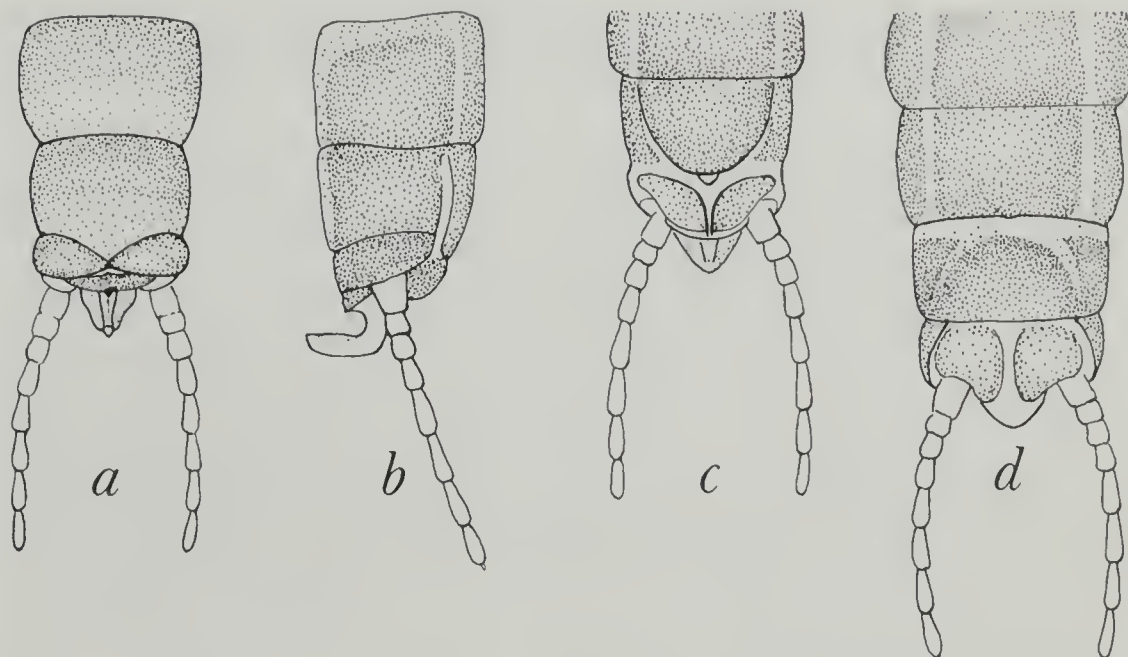


Fig. 11 *Capnopsis schilleri* (Rostock): a-c tip of the male abdomen in dorsal (a), lateral (b) and ventral view. (c); d tip of the female abdomen in ventral view.

be collected in the stream reaches of the bottom valley streams at 500-700 m. Its flight periods extends from the beginning of May to July.

Remarks. As stated by Zwick (1984), the eastern races of *Capnopsis* differ from *C. schilleri schilleri* mainly by a lesser degree of reduction of the hind wings, by varying number of cercus segments in the adult and by differences in body hairiness in the nymph.

Distribution. The subspecies *schilleri* occurs in Western Europe and in Tunisia. In Italy it was never found in the Alps and has a scattered and disjointed distribution in the Apennines, where it has been recorded in few sites (Fig. 5d). LOMBARDIA: Costiolo del Giovà (Ravizza, 1974b). LIGURIA: Monte Aiona (Consiglio, 1960); Sesta Godano! EMILIA-ROMAGNA: Ferriere! Bedonia-Cordolo (Ravizza & Ravizza Dematteis, 1978); Lagdei di Corniglio, Bosco di Corniglio, Le Ghiare di Corniglio (Ravizza Dematteis & Ravizza, 1994); Passo dei Fangacci (Consiglio, 1960); Monte Fumaiolo, La Santona Selva dei Pini, Monte Falco Foresta di Campigna (Consiglio, 1971); La Stretta, Foresta Lama, Cullacce Fonte Maresciallo (Fochetti & Campadelli, 1991). TOSCANA: Vivo d'Orcia (Nicolai & Fochetti, 1981). CALABRIA: (Aubert, 1953); Le Gambarie!

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